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5688-040 IBM C/370 COMPILER VERSION 1 RELEASE 1

5688-039 IBM C/370 LIBRARY VERSION 1 RELEASE 1

5688-040 IBM C/370 COMPILER VERSION 1 RELEASE 1

5688-039 IBM C/370 Library Version 1 Release 1

ABSTRACT

The IBM C/370 Compiler and Library implement the current SAA C language definition in TSO/E and IMS/VS Data Communications subsystem environments of

MVS/ESA(tm), and in CMS under VM/SP and VM/XA(tm). These implementations also comply with the draft ANSI C standard (X3J11). The IBM C/370 Library is the run-time library which is a corequisite of the IBM C/370 Compiler; the IBM C/370 Library is invoked dynamically at program execution time. C is a general purpose, high function programming language that can be used for developing and executing a wide range of applications in areas such as engineering/scientific, manufacturing, graphics, communications, and banking/finance. These licensed programs are the follow-on products for the IBM C For System/370 Program Offerings (5713-AAG and 5713-AAH). An optional product, INSPECT for C/370 and PL/I (5658-995), announced today in Ivory letter (see RFA # R14184), is an interactive debugger which can be used with C/370.

PRODUCT POSITIONING

Few programming languages possess the flexibility of the C language. This general purpose, high function programming language has become popular with application programmers worldwide. C/370 will allow programmers to take advantage of C's high-level control and data structures while affording the same capabilities as other modern, structured programming languages. It also provides bit manipulation capability.

The IBM C/370 program product is the IBM SAA C language product for S/370. It can help increase productivity by minimizing rework when migrating or transferring a C application to another SAA environment. This results in extended application use beyond the original development environment as well as enabling programmers to enhance their expertise by creating applications with the ability to work in a variety of operating environments.

C/370 can be used for developing a wide range of applications such as engineering/scientific, graphics, manufacturing, communications, banking/finance and many more.

C/370 implements the draft ANSI C standard (X3J11) as interpreted by IBM on May 13, 1988. In addition the following IBM products and capabilities are supported:

- IMS DB/DC environment, database access using DL/I
- SQL/DS database access for the VM environment
- DB2 database access for the MVS environment

- Calls to routines that use OS linkage
- The 31-bit addressing capabilities of MVS/XA and VM/XA
- GDDM (tm) and ISPF, which can be invoked directly
- VSAM access methods
- Interlanguage calls to and from PL/I
- Calls to FORTRAN and Assembler
- INSPECT (5658-995) provides comprehensive debugger support

These licensed programs are the follow-on products for the IBM C For System/370 Program Offerings (5713-AAG and 5713-AAH).

IBM Systems Application Architecture(tm) is a collection of selected software interfaces, conventions, and protocols whose initial set of specifications were published in 1987. IBM SAA will be the framework for development of consistent applications and cooperative processing across the major IBM computing environments -- ESA/370(tm), AS/400(tm) and OS/2(tm). Systems Application Architecture consists of four related elements: Common User Access, Common Programming Interface, Common Communications Support and Common Applications.

The Common Programming Interface, of which the C language is an element, consists of the languages and services used to productively develop applications that can be integrated with other applications and ported to run in multiple IBM SAA environments.

For additional information on SAA, refer to Programming Announcements 287-088 dated March 17, 1987; 287-471 dated October 20, 1987; and 288-336 dated June 21, 1988.

HIGHLIGHTS

- Full program reentrancy
- Dynamic Linking capability
- System Architectures capabilities
- Relational Database support (SQL/DS and DB2)
- Interactive full-screen source level debugger support
- VSAM and Extended I/O support
- Interlanguage calls
- IMS/VS DB/DC and DL/I support

DESCRIPTION

- Full Program Reentrancy: Allows multiple users to share a single copy of the read-only (code) portion of an application. This can lead to savings due to reductions in load time and a reduction in system overhead due to a decrease in paging/swapping. Full reentrancy is supported for all C/370 programs, including those which modify static or external data.

  Both the IBM C/370 Compiler and the IBM C/370 Library are fully reentrant.

- Dynamic Linking Capability: The components of a C/370 program do not need to be statically link-edited into the executable module. The library routine fetch allows the application to dynamically invoke routines

in other load modules. In addition, the C/370 run-time library is dynamic and fully reentrant. This may lead to savings in DASD (since a single copy of a piece of code can be shared by multiple programs) and a

saving in program load time since code need only be loaded when it is actually needed.

- System Architectures Capabilities: IBM C/370 and its generated code can run on MVS/SP V3.1 (MVS/ESA). The 31-bit addressing capabilities of the 370-XA environment are exploited. This allows for a much greater code/data space for programs as compared to non-370-XA (24-bit) addressing. User C/370 programs and the Compiler may all be placed above the 16Mb line; only a small portion of the Library need reside below the 16 Mb line.

  C/370 supports calls to routines that use OS linkage.

- Relational Database support: SQL preprocessors are available separately to permit C/370 to take advantage of imbedded SQL statements in conjunction with IBM's DB2 product on the supported MVS systems and SQL/DS on the supported VM systems. See the Programming Requirements for the Version and Release levels.

- Interactive full-screen source level debugger: INSPECT (5658-995) For C/370 And PL/I is a new source-level interactive testing and program analysis licensed program. With INSPECT, programmers can examine, monitor, modify and control the execution of IBM C/370 programs. It uses commands similar to C statements and operates in full-screen as well as line mode.

- System function: The IBM C/370 system library function can be used to execute a command, service or another program from within the current one.

- Inline Code for Library functions: IBM C/370 generates inline code for commonly used string/memory manipulation routines such as mem/strcpy, strlen, memset, strcmp, memcmp and abs. This improves performance at execution time by replacing calls to these library functions with inline Assembler code.

- ISPF/GDDM(tm) Support: IBM C/370 allows access to the Interactive System Productivity Facility (ISPF) Dialog Management Services and to the Graphic Data Display Manager (GDDM).

- VSAM and Extended I/O support: IBM C/370 provides full I/O support for Virtual Storage Access Method (VSAM) on MVS and sequential (non-VSAM) data sets/files, using the standard C/370 library I/O functions.

  VSAM key-sequenced (KSDS), entry-sequenced (ESDS) and relative-record (RRDS) data sets are supported. Using VSAM, data can be accessed via sequential and via specified key.

  Sequential datasets may be in fixed, variable or undefined record formats. Blocked, unblocked and spanned records are supported. As an ex-

tension to ANSI C, IBM C/370 supports record-at-a-time accessing of files.

C/370 programs can create and access in-storage "memory" files to allow for high-performance, temporary storage.

The three C standard I/O streams may be redirected at program invocation to direct the program to read/write to files rather than to the terminal.

- Inter-Language Calls: A C/370 function may invoke an OS PL/I routine or be invoked by an OS PL/I routine. A C/370 function may also invoke VS FORTRAN routines which may allow access to additional numerically oriented processing capabilities.

  PROLOG and EPILOG assembler macros are provided to assist in the creation of assembly-language functions that may be invoked by C/370.

- IMS/VS DB/DC and DL/I support: Information Management System/Virtual Storage (IMS/VS) is a database/data communications (DB/DC) environment under which IBM C/370 applications may execute. IBM C/370 provides advanced C-IMS error handling and direct calls to DL/I.

- Data Aggregate Layout: The mapping of C bitfield variables (variables of a specified number of bits in size) have been defined so as to enable easy mapping between C/370 structures/unions to externally-dictated data formats.

- Compiler Listings: Listings resulting from an IBM C/370 compilation can include aggregate maps and cross-reference information. The listing can also show source lines which contain macro invocations, both before and after macro expansion. This feature can be of great assistance in diagnosing errant programmer macro definitions.

  Listings with C/370 source interspersed with the corresponding assembly-language are also available.

- Common Programming Interface: The C/370 language is an element of the Common Programming Interface and consists of the languages and services used to productively develop applications that can be integrated with other applications and ported to run in multiple IBM SAA environments.

  For additional information on SAA, refer to Programming Announcements 287-088 dated March 17, 1987; 287-471 dated October 20, 1987; and 288-336 dated June 20, 1988.

National Language Support

IBM C/370 implements the ANSI C setlocale function which enables programmers to change the formatting convention for date, time, numeric and monetary data, and to set character classification and character collation tables in accordance with National Language conventions. Locales for France, Germany, Italy, Spain, UK and USA are provided. These locales are applicable not only to these six countries, but also to other countries which have similar for-

matting conventions, character classification or character collating tables

as the above countries. IBM C/370 implements the ANSI C wchar-t type and its associated conversion functions which provide support for Double Byte Character Sets such as EBCDIC-DBCS (i.e. Kanji character set). IBM C/370 also implements a set of wchar-t I/O directives and a comprehensive set of wchar-t string functions as defined in the SAA CPI C Reference.

SPECIFIED OPERATING ENVIRONMENT

Machine Requirements

All C/370 Version 1 Program Product programs can be compiled and are designed to run on any IBM 43XX, 308X, 3090 or 937X Processor supported by the operating systems listed in the Programming Requirements section. Except for normal requirements for MVS/XA control blocks and buffers, these products do not require any virtual storage in the common area below 16 Mb.

The processor must have sufficient real storage to meet the combined storage requirement of the host operating system and access method used.

Programming Requirements

These licensed program products will run under the latest release of the following S/370 programming systems:

- MVS/SP Version 3 Release 1.0 (MVS/ESA), 5685-001 or 5685-002
- MVS/SP Version 2 Release 2 (MVS/XA), 5740-XC6 or 5665-291O
- VM/SP Release 5, 5664-167, or later, with or without HPO
- VM/XA SP Release 1, 5664-308, or later

The C/370 Library is a corequisite with the C/370 Compiler for the compilation of the source code. Once compiled, only the C/370 Library is needed to run the executable load module.

OS PL/I Version 2 Release 2 (5668-909 or 5668-910) is required for interlanguage calls to PL/I. DB2 V2 (5665-DB2) or SQL/DS V2.2 (5688-004) is required for SQL support. C/370 allows calls to VS FORTRAN V2.2 (5668-806).

C/370 supports IMS/VS V2.2 (5665-332) which provides significant virtual storage constraint relief and is the base release for MVS/ESA utilization. Support for IMS/VS V1.3 (5740-XX2) is also provided to enable users to migrate to the more recent IMS/VS V2.2.

COMPATIBILITY

IBM C/370 supports all functions in IBM C for System/370 Program Offering

(5713-AAG or 5713-AAH), with upward source level capability except for changes to support the current SAA C and the draft ANSI C (X3J11) standards as interpreted by IBM on May 13, 1988. IBM C/370 does not support MVS/SP Version 1.

MIGRATION (None)

CONVERSION (None)

SECURITY, AUDITABILITY, AND CONTROL

The announced programs use the security and auditability features of the host hardware system.

User management is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communication facilities.

PUBLICATIONS

Unlicensed Documentation

A memo, program directory, and one copy of the following publications are supplied automatically with the basic machine-readable material: The following publications are supplied with the IBM C/370 Compiler:

Title	Order #
IBM C/370 Licensed Program Specifications	GC09-1262
IBM C/370 User's Guide	SC09-1264
IBM C/370 Reference Summary	SX09-1088
IBM C/370 General Information	GC09-1281
SAA CPI C Reference	SC09-1308

One of the following publications will be supplied with the IBM C/370 Library for the applicable operating system:

Title	Order #
OS PL/I V2 Installation and Customization under MVS	SC26-4311
OS PL/I V2 Installation and Customization under CMS	SC26-4312

Additional copies of unlicensed publications will be available for a fee by the availability date. These copies may be ordered from your IBM marketing representative through SLSS or by direct order.

Licensed Documentation

The following licensed material for the IBM C/370 Compiler will be available from IBM by the availability date. To order, contact your IBM marketing representative.

The first copy is available at no charge to licensees of basic material. Use the 8028 feature number to order additional copies for a fee.

Title	Order Number	Add'l Copies Feat. #
IBM C/370 Diagnostic Guide & Reference	LY09-1802	8028

Customers registered for licensed material will receive all updates automatically.

Subsequent updates (technical newsletters or revisions between releases) to the publications shipped with the product will be distributed to the user of record for as long as a license for this software remains in effect. A separate publication order or subscription is not needed.